

REMARKS

Claims 1-48 and 80-149 have been withdrawn and Claims 49-79 remain pending. Claims 49, 50, 53, 60, 64-71 and 73 have been amended, with the full support of the specification, in a way which is thought to address the Examiner's § 112 concerns while more distinctly claiming and particularly pointing out that which Applicants believe to be inventive. Further amendments have been made for purposes of providing proper antecedent basis, to correct typographical errors, for example, in paragraphs 65, 95 and 103, and to correct dependencies. Corrected copies of Figures 2 and 3 have been provided. New claims 150-161 have been added with the full support of the specification for consideration by the Examiner, which are thought to be patentable. Also, for the Examiners convenience, a copy of the Radiodetection technical specification that was listed on the Form 1449 filed with Applicant's IDS on 2/21/02 is included herewith for consideration by the Examiner. A copy of this reference should also be found in the parent application serial number 09/854,036 filed on 5/14/01 as indicated in the IDS filed on 2/21/02. Applicants appreciate the Examiner's review of the Application.

The § 112 Rejections

Claims 49 and 64 have been amended in accordance with the Examiner's concerns in a way which is intended to point out that the frequency control arrangement controls the frequency of the locating signal and, further, that a frequency code is used to indicate the selected frequency to the locator. These features are described, for example, at paragraphs 97 and 107 of the specification. Claim 73 has also been amended in a way which is thought to recite that the locator receives the transmitted frequency designation. Accordingly, it is respectfully submitted that the § 112 rejections have been overcome.

The § 103 Rejections

The Examiner rejected claims 49-79 under 35 U.S.C. § 103(a) as being unpatentable over U.S. Patent no. 5,361,029 issued to Rider et al. (hereinafter Rider I) in view of U.S. Patent no. 5,264,795 issued to Rider (hereinafter Rider II) and U.S. Patent no. 5,337,002, issued to Mercer. Applicants respectfully disagree, as will be discussed immediately hereinafter.

Rider I is relied on, in the context of the present § 103 rejection, for teaching "a transmitter which transmits a locating signal at a selected one of a plurality of frequencies." Transmitter 100 of Rider I, shown in Figure 14 of the patent, is a multi-frequency transmitter. However, the transmitter is not configured for use in a boring tool, but rather is configured for simultaneous connection to a plurality of individual buried lines. These buried lines then serve as antennas which are driven by the Rider I transmitter. This use is clearly illustrated by Figure 3 of Rider I. When so connected, the transmitter transmits a different frequency from each different inground line.

The Examiner admits that Rider I fails to show the use of a boring tool, and relies on Rider II and Mercer for showing a boring tool. In the context of attempting to meet the claimed combination, the Examiner suggests that the Rider I transmitter "can be used in conjunction with a boring tool in which the transmitter is mounted." Applicants respectfully disagree with this rationale. At column 1, lines 56-57, Rider I mentions the use of "a small transmitter located within the boring tool." Applicants, however, are unable to find any reasonable suggestion in Rider I that this "small transmitter" is or even could be multi-frequency transmitter 100. Clearly, the latter is not suited for use in a boring tool, as it is shown in Figure

3 of Rider I. Moreover, Applicants are unable to find any teachings in Rider I as to how this transmitter could be adapted for use in a boring tool, let alone any motivation for doing so. Unlike the present invention, Rider I is attempting to solve the problem of distinguishing between different inground lines that are buried within the same region.

If transmitter 100 of Rider I were usable in a boring tool, it is submitted that an appropriate illustration, consistent with what Rider I does teach, would show a plurality of boring tools operating in one region, such that each boring tool transmits a different locating frequency. That is, a system for tracking a plurality of boring tools, as opposed to tracking a plurality of buried lines. While the boring tool transmitter and locator of the present invention could be used to transmit and receive different locating frequencies from different boring tools, the elegance of this system and attendant method resides in the novel capability to switch locating frequencies "on-the-fly" during a drilling operation. As described, for example, in paragraph 117 of the present application, it is highly advantageous to switch to a lower locating frequency in the presence of concrete rebar.

Seen in this light, it is clear that the present invention is directed to solving a problem that is completely unrelated to the problem that Rider I is addressing. Specifically, Rider I is directed to distinguishing locating signals that are transmitted from different inground lines. Claim 49, in contrast, requires a boring tool which is configured with a multi-frequency transmitter. That is, a single object from which different frequencies can selectively be transmitted. In this regard, it is submitted that Rider I, either alone or in any reasonable combination with the remaining art of record, fails to teach, disclose or suggest such an arrangement. The illustration of a boring tool in Rider II and Mercer clearly fails to teach the numerous and extensive modifications which would be required to use the Rider I transmitter in a boring tool and, like Rider I, provide no motivation for such modifications, particularly when it is remembered that Rider I teaches the transmission of a different frequency from each of a plurality of different inground objects. For example, Applicants find no teaching in Rider I as to how to selectively use this transmitter to transmit different frequencies from the same buried line nor any motivation to do so. Moreover, even if combined in the suggested manner (which Applicants continue to believe is unreasonable), it is submitted that placing the Rider I transmitter within an inground boring tool would result in an inoperable structure that is unsuited for its intended purpose. Accordingly, for these reasons standing on their own, it is respectfully submitted that claim 49 is patentable over the art of record in any reasonable combination. Moreover, it is considered that additional compelling reasons favor the patentability of claim 49 over the art of record, as will be discussed immediately hereinafter.

Claim 49, as amended, requires transmitting a locating signal from a boring tool using a transmitter that is operable at a selected one of at least two frequencies. Amended claim 49 further recites the step of transferring the selected frequency to the locator using a frequency code that is capable of identifying each of the possible frequencies at which the locating signal can be transmitted. Applicants are unable to find any teaching, disclosure or reasonable suggestion in the art of record, in any reasonable combination, with respect to transmitting a frequency code from a boring tool, in the claimed manner. Moreover, it is submitted that the art of record is devoid of any motivation which would lead one to transmit an indication of a selected frequency from a boring tool using such a frequency code. This feature is considered, in and by itself, to be highly advantageous. Accordingly, for this reason standing on its own, allowance of claim 49 is respectfully requested.

With respect to the frequency indication limitation present in original claim 49, the Examiner states that:

It would have been obvious to employ the locator arrangement and technique of Rider et al in conjunction with a system in which a boring tool is moved through the ground, by transmitting the locating frequencies from the boring tool, as disclosed by Rider and Mercer, in order to implement the teaching of Rider et al of using the locator for such purpose.

Applicants respectfully disagree with this assertion. It is well-settled in the case law that, in order to support a modification of a reference in making out a proper rejection under § 103, the prior art itself is required to objectively teach the proposed modification. Here, it is submitted that the teaching of a boring tool which transmits a locating signal, as encompassed by Rider II and Mercer, fails to provide the required motivation to modify Rider I in the suggested manner. The required modifications are considered as neither trivial nor obvious in view of what Rider I does teach: a transmitter, for above ground use, that is connectable with a plurality of buried lines (see, for example, col. 7, ln. 35). In this regard, it is impermissible within the framework of § 103 to pick and choose from a reference only so much of it as will support a conclusion of obviousness to the exclusion of other parts necessary to a full appreciation of what the reference fairly suggests to one skilled in the art.

With respect to the suggested modification of Rider I, it appears that the Examiner may be relying on personal knowledge that such transmission of a frequency indication from a boring tool falls within the routine discretionary capabilities of the skilled practitioner and is thought to be a matter of mere design choice wherein the Examiner is taking Official Notice of a matter of common knowledge in the art. If this continues to be the case in light of the amendments made to claim 49, Applicants respectfully traverse the rejection on these grounds and request an express showing of documentary proof, or an affidavit, as required by MPEP § 2144.03, in the event the rejection is maintained on these grounds. Accordingly, for all of these reasons, allowance of amended claim 49 is respectfully requested.

Claims 50-63, as amended, are dependent claims which depend directly or indirectly from claim 49, thereby including the limitations of claim 49. Accordingly, it is respectfully submitted that claims 50-63, as amended, are also patentable over the art of record for at least the reasons set forth above with respect to claim 49. Further, each of these dependent claims places additional limitations on their parent and intermediate claims which, when considered in light of claim 49, further distinguish the claimed invention from the art of record.

For example, claim 50, as amended, recites transmitting the frequency code from the transmitter on a carrier frequency that is separate from the locating signal. With regard to original claim 50, the Examiner states that it would have been obvious to provide a separate carrier frequency to provide locating signals that are not encumbered by additional information. Applicants respectfully disagree. It is again important to understand that a suggested modification under the standards of § 103 is only proper where the prior art objectively teaches the modification. Applicants are unable to find such a teaching in the art of record. With respect to the use of a separate carrier for transmitting the frequency information, it appears that the Examiner is apparently relying on personal knowledge that such use of a separate carrier falls within the routine discretionary capabilities of the skilled practitioner and is thought to be a matter of mere design choice wherein the Examiner is taking Official Notice of a matter of common knowledge in the art. If this continues to be the case in light of the amendments made to claim 50, Applicants respectfully traverse the rejection on these grounds and requests an express showing of documentary proof, or an affidavit, as required by MPEP § 2144.03, in the event the rejection is maintained on these grounds.

As another example, claim 51 recites transmission of pitch and roll information on the separate carrier frequency.

As still another example, amended claim 52 recites repeating the transfer of the frequency code or indication at predetermined intervals in time. Accordingly, the locating frequency data is updated with each transfer. This feature, in combination with transmission on a carrier that is separate from the locating signal is considered to be highly advantageous, as described in paragraph 120 of the specification, since

[T]he receiver is able to find the locating signal by merely reading the relevant data and is dynamically responsive when the locating frequency toggles.

Applicants respectfully submit that the art of record is completely devoid of any reasonable suggestion of this combination of features. It is noted that Applicants are unable to find a rationale for the rejection of claim 52, under § 103, in the Office Action.

As yet another example, amended claim 53 recites detecting a command issued to the transmitter in the boring tool to change the frequency of transmission. At least one indication is sent to the locator, regarding the frequency change, which designates the different locating frequency on which transmission will proceed. It is noted that Applicants are unable to find a rationale for the rejection of claim 53, under § 103, in the Office Action.

As still another example, claim 54 recites the use of a roll sequence, applied to the boring tool, for use in issuing the frequency change command. It is noted that, in the context of this rejection, the Examiner has referred to transmission of roll information on a separate carrier. What is claimed, however, is considered to bear no relationship to transmission of roll data nor the use of a separate carrier. Rather, a highly advantageous roll sequence is used to cause the transmitter in the boring tool to initiate transmission of a different locating frequency. Applicants are unable to find this feature in the art of record. In this regard, transmitter 100 of Rider I is configured for connection with a plurality of lines such that a different frequency is transmitted from each line.

As a further example, claim 55 recites sending the indication at least once prior to switching frequencies. Claim 56, in contrast, recites sending the indication at least once after switching frequencies. Further, claim 57 recites transmission of an indication both prior to and following the transmission frequency change. Claim 58 recites changing the receiving frequency, at the portable locator, responsive to receiving an indication of the different locating frequency. Claim 59 recites the highly advantageous feature of automatically performing the frequency change in the locator using the frequency control arrangement. Applicants are unaware of such features in use with a boring tool and portable locator. With regard to these features, the Examiner states that these:

[W]ould fall within the routine discretionary capabilities of the skilled practitioner exercised in accordance with the operational status and functional requirements of the boring tool and the optimization thereof.

Applicants respectfully disagree that the claimed features could fall within optimization of functional requirements of the boring tool and continue to believe that these features embrace patentable novelty. Accordingly, it is believed that the Examiner is relying on personal knowledge that such features fall within the routine discretionary capabilities of the skilled

practitioner and are thought to be a matter of mere design choice. Applicants respectfully disagree. As such, it is believed that the Examiner is taking Official Notice of a matter of common knowledge in the art. If this continues to be the case with respect to claims 55-59, Applicants respectfully traverse the rejection on these grounds and request an express showing of documentary proof, or an affidavit, as required by MPEP § 2144.03, in the event the rejection is maintained on these grounds.

Claim 60 recites detection of a command issued to the transmitter in a predetermined way to change the selected locating frequency and, thereafter, modulating the new frequency code at least once on the locating signal, prior to switching the receiving frequency of the locator. Claim 61 further recites the use of a roll sequence whereby to issue the command. With regard to claim 60, Applicants are unable to find a rationale for the rejection of this claim, under § 103, in the Office Action. With regard to claim 61, the Examiner has referred to transmission of roll information on a separate carrier. What is claimed, however, is considered to bear no relationship to transmission of roll data nor the use of a separate carrier. Rather, a highly advantageous roll sequence is used to cause the transmitter in the boring tool to initiate transmission of a different locating frequency.

Claim 62 recites performing the indicating step at least once responsive to powering up the transmitter. Claim 63 recites detailed limitations including using a frequency selection arrangement forming part of the transmitter to detect the selected one of the locating frequencies as a transmitter power-down locating frequency at a time when the transmitter is switched from a transmitter operational state to a transmitter off state. The transmitter is then restarted at least initially configured to resume transmitting at the transmitter power-down locating frequency upon switching from the transmitter off state to the transmitter operational state. The transfer step is then repeated at least once responsive to restarting the transmitter. Applicants respectfully disagree that the claimed features could fall within optimization of functional requirements of the boring tool and continues to believe that these features embrace patentable novelty. Accordingly, it is believed that the Examiner is relying on personal knowledge that such features fall within the routine discretionary capabilities of the skilled practitioner and are thought to be a matter of mere design choice. Applicants respectfully disagree. As such, it is believed that the Examiner is taking Official Notice of a matter of common knowledge in the art. If this continues to be the case with respect to claims 62 and 63, Applicants respectfully traverse the rejection on these grounds and requests an express showing of documentary proof, or an affidavit, as required by MPEP § 2144.03, in the event the rejection is maintained on these grounds.

Claim 64 is an independent claim which reflects the limitations of claim 49, as amended, but in apparatus form. Accordingly, the arguments made above with respect to the patentability of claim 49 are equally applicable with respect to the patentability of claim 64 over the art of record and are hereby asserted on behalf of claim 64. Accordingly, for at least the reasons given above, allowance of claim 64 is respectfully requested.

Claims 65-72, as amended, are dependent claims which depend directly or indirectly from claim 64, thereby including the limitations of claim 64. Accordingly, it is respectfully submitted that claims 65-72, as amended, are also patentable over the art of record for at least the reasons set forth above with respect to claim 64. Further, each of these dependent claims places additional limitations on their parent and intermediate claims which, when considered in light of claim 64, further distinguish the claimed invention from the art of record.

For example, amended claim 65 recites transmitting the frequency code corresponding to a different one of the

locating frequencies, that is different from the current frequency, at least once prior to changing the current locating frequency to the different locating frequency. Applicants are unable to find this feature in the art of record in any reasonable combination.

As another example, claims 66-68, as amended, include limitations which reflect those of claims 50-52, respectively, but in apparatus form. Accordingly, it is submitted that each of claims 66-68 is allowable at least for the reasons given above with respect to its corresponding method claim.

As still another example, claims 69 and 70, as amended, include limitations which reflect those of claims 56-57, respectively, but in apparatus form. Accordingly, it is submitted that each of claims 69 and 70 is allowable at least for the reasons given above with respect to its corresponding method claim.

As yet another example, claim 71 recites that the frequency control arrangement is configured for detecting a command issued to the transmitter in a predetermined way to change the selected frequency to a different one of the frequencies as a roll sequence to which the transmitter is subjected. It is noted that, in the context of this rejection, the Examiner has referred to transmission of roll information on a separate carrier. Again, what is claimed is considered to bear no relationship to transmission of pitch/roll data nor to the use of a separate carrier. Rather, a highly advantageous roll sequence is used to cause the transmitter in the boring tool to initiate transmission of a different locating frequency. Applicants are unable to find this feature in the art of record.

Claim 72 includes limitations which are related to certain limitations that are encompassed by claim 62, as described above, but in apparatus form. Accordingly, the arguments made above with respect to the patentability of claim 62 over the art of record are equally applicable with respect to claim 72 and are hereby asserted on behalf of claim 72.

Claim 73 is an independent claim which, as amended, recites a transmitter forming part of the boring tool for transmitting a locating signal at a current one of at least two locating frequencies and for transmitting a frequency designation identifying one of the frequencies of the locating signal. In the context of this § 103 rejection, it appears that the structure of the rejection suggested by the Examiner is essentially the same as that applied to claim 49, as discussed above, relying on Rider I with respect to transmitter 100 and relying on the remaining art of record as teaching a boring tool. Applicants respectfully disagree. It is submitted that the framework of this rejection is equally as ineffective with respect to at least certain limitations that are embraced by claim 73. For example, as argued above, Rider I fails to teach a transmitter for use in a boring tool that is capable of transmitting a locating signal at a current one of at least two frequencies. Rather, Rider I teaches a transmitter that is configured for above ground use for purposes of transmitting signals at different frequencies from each one of a plurality of inground lines. Moreover, for the reasons given above, it is submitted that the remaining art of record fails to teach, disclose or suggest, in any reasonable combination with Rider I, the modification of Rider I in a way which results in the combination of features that is encompassed by amended claim 73. It is further submitted that there are additional compelling reasons which favor the patentability of claim 73 over the art of record, as will be described immediately hereinafter.

Claim 73, as amended, requires a frequency tracking arrangement which is configured for switching the locator between different ones of the locating frequencies, as the current frequency, based on a frequency designation. Applicants are unable to find any teaching or reasonable suggestion of such a configuration within the art of record. For all of the foregoing

reasons, Applicants respectfully request allowance of claim 73 over the art of record.

Claim 74 is directly dependent from claim 73, thereby including its limitations. Accordingly, it is respectfully submitted that claim 74 is also patentable over the art of record for at least the reasons set forth above with respect to claim 73. Further, this dependent claims places additional limitations on its parent claim which, when considered in light of claim 73, further distinguish the claimed invention from the art of record. For example, claim 74 requires automatic switching between the locating frequencies.

Claim 75 is an independent claim which, as amended, recites configuring a transmitter, for use in the boring tool, for transmitting the locating signal at a selected one of at least two frequencies. In the context of this § 103 rejection, it appears that the structure of the rejection suggested by the Examiner resembles that applied to claim 49, as discussed above, relying on Rider I with respect to transmitter 100 and relying on the remaining art of record as teaching a boring tool. Applicants respectfully disagree. It is submitted that the framework of this rejection is equally as ineffective with respect to at least certain limitations that are embraced by claim 75. For example, as argued above, Rider I fails to teach a transmitter for use in a boring tool that is capable of transmitting a locating signal at a current one of at least two frequencies. Rather, Rider I teaches a transmitter that is configured for above ground use for purposes of transmitting signals at different frequencies from each one of a plurality of in-ground lines. Moreover, for the reasons given above, it is submitted that the remaining art of record fails to teach, disclose or suggest, in any reasonable combination with Rider I, the modification of Rider I in a way which results in the combination of features that is encompassed by amended claim 75. It is further submitted that there are additional compelling reasons which favor the patentability of claim 75 over the art of record, as will be described immediately hereinafter.

Claim 75 further recites using a control arrangement, forming part of the locator, for detecting a selected one of said locating frequencies as a power-down locating frequency at a time when the locator is initially powered down. Thereafter, the locator is powered up at least initially configured for receiving the power-down locating frequency. With regard to this feature, Applicants respectfully disagree that the claimed features could fall within optimization of functional requirements of the boring tool and continues to believe that these features embrace patentable novelty. Accordingly, it is believed that the Examiner is relying on personal knowledge that such features fall within the routine discretionary capabilities of the skilled practitioner and are thought to be a matter of mere design choice. Applicants respectfully disagree. As such, it is believed that the Examiner is taking Official Notice of a matter of common knowledge in the art. If this continues to be the case with respect to claim 75, Applicants respectfully traverse the rejection on these grounds and request an express showing of documentary proof, or an affidavit, as required by MPEP § 2144.03, in the event the rejection is maintained on these grounds.

Claim 76 is an independent claim including limitations which resemble those of claim 75, but in apparatus form. Accordingly, at least the arguments made above with respect to the patentability of claim 75 over the art of record are equally applicable with respect to claim 76 and are hereby asserted in its behalf.

Claims 77-79, as amended, are dependent claims which depend directly or indirectly from claim 76, thereby including the limitations of claim 76. Accordingly, it is respectfully submitted that claims 77-79, as amended, are also patentable over the art of record for at least the reasons set forth above with respect to claim 76. Further, each of these dependent claims places additional limitations on their parent and intermediate claims which, when considered in light of

claim 76, further distinguish the claimed invention from the art of record.

For example, claim 77 recites that the transmitter is configured for sending an indication of the selected frequency of the locating signal to the locator. Applicants are unaware of a boring tool in the prior art being configured with such a transmitter. Moreover, it is considered that the art of record is not reasonably combinable in a way which leads to the claimed combination.

As another example, claim 78 recites a frequency selection arrangement for use at the boring tool at least for detecting the selected one of said locating frequencies as a transmitter power-down locating frequency at a time when the transmitter is switched from a transmitter operational state to a transmitter off state and for restarting the transmitter at least initially configured to resume transmitting at the transmitter power-down locating frequency upon switching from the transmitter off state to the transmitter operational state. It is noted that arguments were made above, with respect to this feature as encompassed by claim 63, although in method form. Accordingly, the arguments made above with respect to this feature made on behalf of claim 63 are equally applicable with respect to the patentability of claim 78 over the art of record. For at least these reasons, allowance of claim 78 is respectfully requested.


As still another example, claim 79 recites that the frequency selection arrangement is configured for sending the frequency selection indication at least once responsive to restarting the transmitter. Again, it is noted that arguments were made above, with respect to this feature as encompassed by claim 63, although in method form. Accordingly, the arguments made above with respect to this feature made on behalf of claim 63 are equally applicable with respect to the patentability of claim 79 over the art of record. For at least these reasons, allowance of claim 79 is respectfully requested.

New claims 150-161 have been presented for consideration by the Examiner and are believed to be patentable over the art of record.

For the foregoing reasons, it is respectfully submitted that all of the Examiner's objections have been overcome and that the application is in condition for allowance. Hence, allowance of these claims and passage to issue of the application are solicited.

If the Examiner has any questions concerning this case, the Examiner is respectfully requested to contact Mike Pritzkau at 303-410-9254.

Respectfully submitted,


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